

Inputs, Outputs, and Related Controls

Mackie E-Z Interfacing

Concerned about levels, balancing, impedance, polarity, or other interface goblins? Don't be. On your Mackie mixer, you can connect almost anything almost anywhere, with nary a care. Here's why:

- Every main input and output is balanced.
- Every 1/4" input and output jack also accepts unbalanced connections.
- Every input is designed to accept virtually any output impedance.
- The main left and right mix outputs can deliver +28 dBu into a 600 ohm load (that's hot!)
- All the other outputs can deliver +22 dBu into a 600 ohm load (that's plenty).
- All the outputs are in phase with the inputs.

All Mackie mixers have both microphone and line-level inputs. Some channels have both, some channels have only line-level inputs. Consult your mixer's quick start guide (or just look at the connector panel) for the exact arrangement. Below is the rear panel of the 1604-VLZ PRO.

Mic? Line? – What's The Difference?



Microphones produce a relatively low voltage, generally in the range of 1 to 250 millivolts, depending on the sensitivity of the mic, and how loud the sound is. Voltages in the 0.15 to 3 volt range are considered to be line-level. These aren't rules or standards, just ways of talking about two widely different operating voltage ranges, both of which are common in audio.

A microphone typically requires 20 to 60 dB of gain in order to bring its signal up to the mixer's operating level. A line-level signal requires little if any gain, and may need to be brought down in level to match

the mixer. So, while there's a wide adjustment range for both mic and line inputs, the mic inputs have higher gain.



Don't forget the Level-Setting Procedure at the beginning of this book. Mic and line inputs are happiest when running at the optimum levels. That procedure will get you there.

Check the Tips section and Glossary for more information about terms we'll be using here like operating level, impedance, balanced, unbalanced, XLR, and TRS. Also study the mixer block diagrams, as each one is worth a thousand words or more.

Mic Inputs

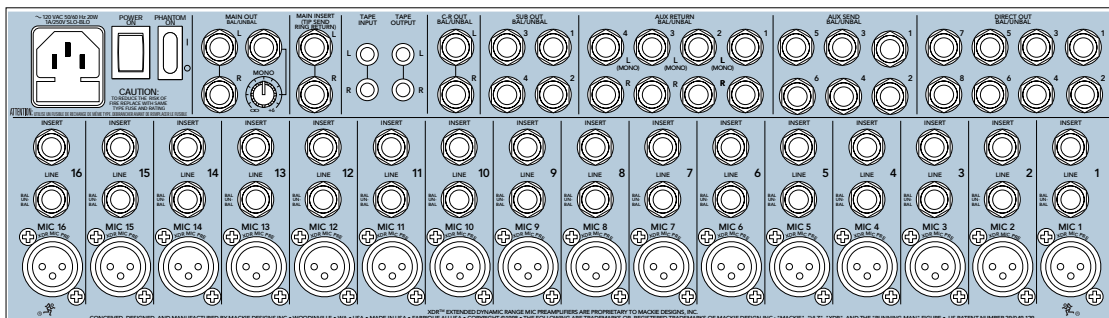
Mackie mixers include phantom-powered, balanced XLR microphone inputs just like the big studio mega-consoles, and for exactly the same reason: A fully balanced circuit is excellent at rejecting hum and noise, and phantom powering means that condenser mics can be used without external power supplies or batteries.

You can plug in almost any kind of mic that has a standard male XLR-type connector without fear of overloading the preamp. Professional ribbon, dynamic, and condenser mics all sound great through these inputs.

XLR Input Connectors – Mic wiring

Nearly all professional mics are designed to connect to a low impedance input, and employ balanced wiring terminating in an XLR-style plug. You'll find an illustration and wiring diagram in the Tips section, chapter 9. We use the wiring convention:

- Pin 1 = shield
- Pin 2 = positive (+ or hot)
- Pin 3 = negative (- or cold)





Even though microphones produce alternating current (AC), they have a definite polarity orientation. Be sure that you don't reverse the wires between pins 2 and 3.

Did you pick up a cool retro mic at a yard sale that has a 1/4" phone plug instead of an XLR? Chances are it's a high impedance mic and it will require a matching transformer in order to sound its best with your mixer. Plug-in transformers available from several sources will not only match the impedance and signal level, but will adapt the plug too.

Phantom Power

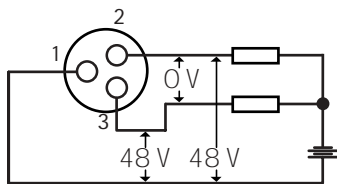
Most condenser mics require phantom power, a system whereby the mixer supplies a DC voltage to the mic's electronics through the same wires that carry audio.

The phantom power on all Mackie mixers (except the Onyx series) is globally controlled by the PHANTOM switch on the rear panel (one switch for each group of 8 mics on the 8-Bus). A PHANTOM LED on the front panel will remind you that phantom power is turned on. The Onyx mixers have a 48V switch and LED indicator on each channel for selective control of phantom power.

"Phantom" owes its name to the ability to disappear when it's not needed, like when connecting dynamic mics (Shure® SM57/SM58, for instance) that don't require external power.

The most common phantom power supply is 48 volts. All Mackie mixers have a 48 volt phantom supply with the exception of the PPM series, which provide 15 volts. Some microphones will operate just fine on lower voltages while others require the full 48 volts. Check your mics' specs.

Here's what the phantom powering circuit looks like:



There's 48 volts between pins 1 and 2 and between pins 1 and 3. Since pins 2 and 3 are both at the same DC potential, the voltage difference between them is zero. That's why an unpowered mic doesn't "see" the voltage.

Barenekked Preamps!

People have thought highly of Mackie mic preamps for a long time, so when it was time to put the engineers to work on some new designs, they brought us the Onyx series, which includes the 800R. This answers a popular customer request for a rack-mounted unit with eight mic preamps, but no other mixer features. The 800R has a few neat tricks up its sleeve which we'll discuss later, but we wanted to mention it in this discussion about microphone preamps.



Dynamic and ribbon mics don't like to see DC voltage applied to their sensitive insides. Normally it won't be, but a shorted or miswired mic cable can cause the full voltage to appear across the sensitive microphone element. Be sure that your cables are in good condition before applying phantom power.

Also, unless you know for certain that it is safe to do so, never plug single-ended (unbalanced) microphones, instruments, or electronic devices into the MIC input jacks if the phantom power is on.



Practice safe phantom powering! Plug in your mics with phantom power switched off! The XDR preamps used in many Mackie mixers have extra protection against damage from "hot plugging," but your mics don't. Get into the habit of plugging mic cables in with the phantom power off, then turning it on.

Line Inputs

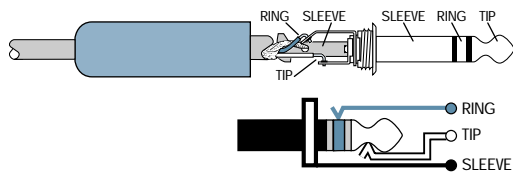
Line inputs on Mackie mixers are on 1/4" TRS (tip-ring-sleeve - the parts of the mating plug) jacks. All Mackie line inputs are balanced and present a moderately high impedance load, around 10 k Ω , depending on the model and the particular input. As we've seen from our block diagram tour, LINE IN jacks on channels with both line and mic inputs share circuitry (but not phantom power) with the mic preamps.

You can use these inputs for virtually any line-level signal. With proper adjustment of the TRIM control, they'll accept signals over a range of approximately -45 to +16 dBu.

Some Mackie mixers are equipped with stereo line inputs. These have two line-level input jacks which share a common set of controls. To learn how signals are routed from these inputs, consult the block diagram or quick start guide for your mixer, or check the Controls section of this manual.

Always be sure to perform the Level-Setting Procedure when connecting to LINE inputs that have TRIM controls, and check the level and adjust it externally on the stereo inputs without TRIMs.

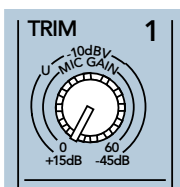
To connect balanced sources to the line-level inputs, use a 1/4" tip-ring-sleeve (TRS) plug, the type found on some stereo headphones:



To connect unbalanced line-level sources, use a cable with 1/4" mono (TS) plugs. In music store lingo, that's an "instrument cable" or "quarter inch patch cord." When a TS plug is inserted into a TRS jack, the Ring (low signal) and Sleeve (ground) get connected together.

See the Mixer Tips section for more information on balanced and unbalanced connections.

The TRIM Control



The TRIM control adjusts the input sensitivity of the MIC or LINE IN jack, to match the input signal to the operating range of the mixer. On all Mackie mixing consoles with the exception of the PPM series, the TRIM control is located at the top of the channel strip. That makes it easy to find, since TRIM is the first control the signal encounters on its way through the console. The PPM series has an Input Level Set control and LED indicator above each channel's VOLUME control.

Whenever you connect a new input, or the input source changes (you move the mic from the dulcimer to the kick drum), you should perform the Level-Setting Procedure. That procedure is "how to use the TRIM control."

Connecting Electronic Instruments



Synthesizers, guitar processors, other electronic instruments, and computer sound cards work fine when connected to the LINE inputs. The pickups on electric guitars and basses, even though the plug fits, are a different animal, however. Pickups require a higher input impedance than the Mackie LINE IN provides. Plugging a guitar into a LINE IN jack will probably make some

sound, but the guitar will lose punch and treble. The proper way to connect an instrument pickup directly to a Mackie mixer is to use a Direct Box (or DI = Direct Injection) between the guitar and a MIC input.

Hi-Z Guitar Inputs

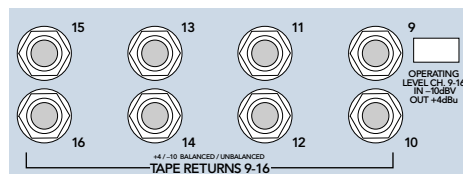


After all that, we decided that it would be a good idea to build a direct instrument input into some of our mixers. On channels 1 and 2 of the Onyx series mixers and 800R preamp, the MIC/HI-Z switch switches the channel input from the XLR mic connector to the 1/4" input jack. This jack provides a high impedance input suitable for directly connecting an instrument pickup, saving you the cost and fuss of using a DI. We're not stuffy – you can plug your bass in here, too.

The Hi-Z jack also serves as a line input jack (it has the same gain as the line inputs on the other channels). When using line inputs with channels 1 and 2, don't forget to push the "Guitar" button.

Tape Returns (8-Bus Only)

The TAPE RETURN jacks on the rear panel of the 8-Bus console are for connecting the outputs of a multitrack recorder.



These are balanced 1/4" TRS jacks which will also accommodate unbalanced connections. They're grouped in sets of eight, with each group having an OPERATING LEVEL switch to properly match the gain of these inputs to pro (+4 dBu) or semi-pro (-10 dBV) recorders.

TAPE RETURN jacks can be routed to either the channel (for mixing) or Mix-B (during tracking). Their fate is determined by the FLIP and MIX-B SOURCE switches.

Tape Inputs

These unbalanced RCA TAPE INPUT jacks are designed to work with semi-pro as well as pro recorders. They provide an unbalanced input at 0 dBu. Connect your 2-track tape recorder's outputs here, using standard RCA cables.

In recording applications, the TAPE INPUT jacks provide a convenient way to play back your mixes through the Control Room monitors. You'll be able to listen to a mix, then rewind and try another pass without repatching or disturbing the mixer levels. In sound reinforcement applications, you can use these jacks to feed intermission music from a tape or CD player without tying up a mixer channel.

If your mixdown recorder has balanced XLR outputs at the "pro" operating level of +4 dBu, then in order to use the TAPE INPUTS, you will have to adapt the connector type, as well as attenuating the signal level by approximately 10 dB to avoid overloading. If the recorder has an output level control, just turn it down. Otherwise, you'll need to purchase or build an in-line attenuator. Alternately, you can connect the recorder outputs through an XLR-TRS cable to a channel line input.

Control and routing of the TAPE inputs varies among models. Check the Control Room Source controls in the Master section for particulars.

Auxiliary Return Inputs

Auxiliary Returns are line-level inputs designed for connecting the outputs of effects devices. They can also be used to connect extra line-level audio sources. They're balanced 1/4" TRS jacks, and will accept signals from just about any pro or semi-pro effects device on the market.

Typically, Auxiliary Returns from effects are routed to the main L/R busses, but on certain models, they can also be easily routed to AUX sends or subgroup busses for more flexibility.

Talkback Microphone Input

Some Mackie consoles are equipped with a connector for a dedicated talkback microphone. A mic plugged into this XLR jack can be routed to the main mix, allowing you to speak to the audience ("And now, let's give a warm welcome to The SLOUGH-TONES - YEAH!!") or via AUX Sends 1-2 to stage monitors or headphones ("Hey Flash! Your D string is flat!").

The talkback mic has its own volume control and routing switches located in the Master area of the console.

The 8-Bus console has the talkback mic built into the console. Just push the button and talk. In addition to communication with the players, the Talkback mic on the 8-Bus console can be sent to the

bus outputs to slate the tape. ("Purple Tears, take seventeen.")

The Onyx series mixers let you have it both ways. There's a built-in talkback mic as well as a connector for an external talkback mic. It has 48 V phantom power (always applied), so you can use a condenser mic if you wish. Remember, though, that it's not a good idea to "hot plug" a mic to a connector that has phantom power. Turn your mixer off before plugging or unplugging your talkback mic whether it's a condenser or a dynamic. It could save your mic!

Don't feel left out if your console isn't equipped with dedicated talkback circuitry. You can accomplish the same thing by plugging a mic into a spare input channel and routing it to wherever you want to be heard.

Main Outputs

When we speak of the main outputs, we're talking about outputs from the left and right (stereo) busses. These outputs are controlled by the MAIN MIX fader. This is where the fully mixed audio enters the real world.

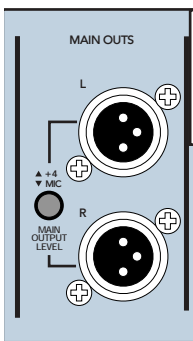
The MAIN OUTPUTS on XLR connectors are differential, providing an extra 6 dB of output level, up to +28 dBu.

The Main outputs are duplicated on impedance balanced 1/4" TRS jacks. These provide up to +22 dBu output level, and work equally well when connected to either balanced or unbalanced inputs. When connected to a balanced input using a TRS plug, they appear to the input as a balanced output with nearly all the benefits of a differential, balanced source. When connected to an unbalanced input, they appear as an unbalanced source, at the same output level as the balanced TRS outputs.

The PPM series mixers, since they're intended primarily for use with their own internal amplifiers, have only 1/4" unbalanced jacks for the main mix outputs.

Main Output Level Switch

Several compact mixer models are equipped with a switch that attenuates the XLR main outputs by 30 dB, bringing them down to approximately the level of a microphone. If you're submixing a group of instruments on stage (say a bunch of keyboards), by switching the output to MIC level, you can send this submix back to the main mixer just as if it were another microphone. It's also handy for connecting to the one mic input they give you in the hotel meeting room.



Mono Output

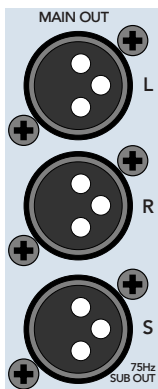
Several Mackie mixers have a dedicated Mono output for those requirements that seem to pop up now and then, demanding a monaural mix of a painstakingly-created stereo panorama. The last thing you want to do is start twirling all your carefully-placed PAN settings to one side. What to do? Stick a cable in the MONO output, hand the other end to Mr. Mono, and you're done. He's got his mono mix and you've still got your stereo mix. The MONO output is nothing more than an equal mix of the left and right MAIN MIX outputs.

Mono Level Control

So, Mr. Mono comes running back, screaming about the level being so loud that his camcorder is melting. Just reach for this knob and turn it down a bit. Just the thing for sending mono signals to mic inputs like camcorders, telephone interface boxes, even answering machines.

Subwoofer (75 Hz) Output

The CFX series of mixers is equipped with a unique feature – a mono output followed by a 3rd order 75 Hz low-pass filter. It sums the left and right main outputs and removes everything but the deepest bass. Connect this output to a high-powered subwoofer, and the music police will be right over. The level of the subwoofer output is fixed relative to the main outputs, so be sure that your subwoofer amplifier (or powered sub) has an adjustable input level for balancing the bass level.



Don't confuse this subwoofer output with its similarly named neighbors, the SUB (subgroup) outputs.

Tape Outputs

These unbalanced RCA jacks tap the MAIN MIX outputs to make simultaneous recording and sound reinforcement more convenient. They're also handy for interfacing consumer recorders or semi-pro computer sound cards.

Direct Outputs

The 1/4" jacks on the 1604-VLZ PRO, 1642-VLZ PRO, and 8-Bus, deliver the signal from nearly the tail end of the channel path: post-TRIM, post-EQ, post-LOW CUT, post-fader, and post-MUTE.

The Onyx mixers also have direct outputs, but they're a bit different, both in form and function, and they're labeled RECORDING OUTS. Rather than using separate 1/4" jacks, these mixers use 25-pin D Subminiature (D-Sub) connectors, providing eight fully balanced direct outputs on each connector. The direct outputs on the Onyx series are more truly "direct," coming straight from the mic preamp stage (which also incorporates the instrument and line inputs). These outputs are unaffected by the equalizer or fader settings and are designed for the cleanest recording of the direct microphone signal.

Optional for the Onyx is a FireWire® (IEEE-1394) card, which provides direct outputs in digital format. This is great for recording your live gigs with a laptop computer.

Not all compact mixer models have direct outputs. Some have direct outputs on only the lower-numbered channels, and only the 8-Bus and Onyx have a DIRECT output on every channel.

Direct outputs are useful for sending the channel straight to a track of a multitrack recorder. A direct output can also be used to send a single channel's signal to an effects processor without using up an Auxiliary send.

Bus/Subgroup Outputs

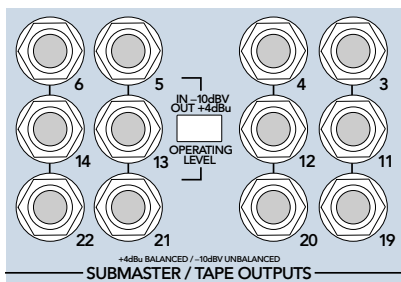
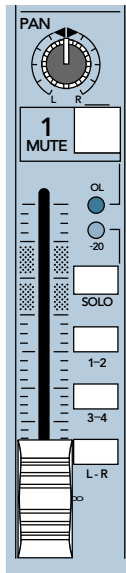
In 4- and 8-Bus consoles, the output of the PAN control can be assigned to subgroup busses. The ASSIGN switches (1-2, 3-4, L-R) direct the channel output to pairs of busses. The subgroup bus outputs appear on the balanced 1/4" TRS SUB OUT jacks.

The subgroup outputs can be used to feed a mix of several channels (for example six mics on a drum kit) to a single pair of recorder tracks.

Bus Output Levels

The subgroup bus output level on all of the Mackie mixers is nominally 0 dBu. The output level of the busses is controlled by the bus faders.

On the 8-Bus console, the bus output level is switch-selectable between +4 dBu and -10 dBV, allowing you to properly match pro or semi-pro recorders.



Double (and triple) Bussing



The bus outputs on the 1642-VLZ PRO, SR, and 8-Bus mixers have duplicate jacks to make connection to a multitrack recorder easier. Even though the SR and 1642 are four-bus mixers with four subgroups, they have eight SUB OUT jacks for feeding eight recorder tracks, thanks to a trick called Double Bussing.

SUB OUTS 1 and 5 carry the same signal, as do 2 and 6, 3 and 7, and 4 and 8. By connecting those eight jacks to the eight inputs of your recorder, you can route any input channel to any track.

To record onto Track 1, assign the input channel to Bus 1 by pressing the 1-2 ASSIGN button and turning the PAN control fully left. On the recorder, put Track 1 into the Record mode, being sure that Track 5 is in the Safe or Play mode. To record on Track 5, use the same bus assignment on the mixer, but put Track 5 in Record. To record on Track 2 or 6, ASSIGN to 1-2 and

pan fully right.

The 8-Bus console extends this trick by tripling the outputs of each of the eight busses to accommodate a 24-track recorder.

On most Mackie mixers, subgroup busses can be routed to the main outputs so that all channels assigned to that subgroup can be controlled by a single fader, retaining the balance and pan position set by the channel controls. You can individually mic each of the background singers, assign their channels to a single subgroup or pair, and use the subgroup fader(s) to bring the background vocals up in the mix when they're needed.

Not all models have the same SUB outputs, level controls, and routing capabilities. Input channels on the CFX series cannot be routed directly to the MAIN outputs, but must first be routed to a pair of subgroup busses, which are in turn assigned to the MAIN outputs by switches in the mixer's Subgroup section. The PPM series has no SUB outputs since it has no subgroups.

ALT 3-4 Outputs

The dual-purpose MUTE/ALT 3-4 switch on the 1202/1402-VLZ PRO and Onyx 1220/1620 mixers is a variation on the subgroup concept. When Greg Mackie was designing our first compact mixer, he wanted to include a mute switch for each channel. Mute switches do just what they say — turn off the signal by sending it into oblivion. “Gee, what a waste,” Greg reasoned. “Why not have the mute button route the signal somewhere else useful - like an alternate stereo bus?”

So MUTE/ALT 3-4 really serves two purposes: muting (handy during a mixdown session or live show) and signal routing. For multitrack recording and live mixing, it serves as an extra stereo bus.

One difference between the ALT 3-4 outputs and BUS OUTs 3 and 4 on the larger consoles is that there's no output level control for those busses — they run at unity gain. Another difference is that it's either/or routing — a channel can't be assigned to both the MAIN and ALT outputs simultaneously. But like the true 4-bus consoles, the ALT busses can be routed to the MAIN outputs, serving as a submaster pair.

To MUTE channels in the main mix, leave the ALT 3-4 outputs disconnected. Pressing the MUTE/ALT 3-4 button switches the channel signal from the MAIN to the ALT 3-4 busses, sending it off to never-never land, disconnecting it from the MAIN MIX, and

effectively muting its input.

To use ALT 3-4 as output busses, just connect the ALT 3-4 outputs to whatever destination you desire. Pressing the MUTE button will remove the channel signal from the MAIN bus and route it to the ALT 3-4 outputs.

The ALT 3-4 outputs are a good way to feed a multitrack recorder when you only need to record one or two tracks at a time, or a good way to feed a stereo sound card in a computer.

AUX Send Outputs

The Auxiliary Send section is like a bunch of mono mixers, one for each Auxiliary output. The AUX controls send a copy of the channel signal to the AUX bus where the signals are mixed and sent to the AUX output. On some of our mixers, these controls are labeled MONITOR and EFX (effects) since those are common uses.

Pre and Post Sends

Auxiliary Sends are designated as PRE or POST. Pre or post what? POST always means post-fader, PRE is always pre-fader. The output level of a PRE send is independent of the position of the channel fader, while the level of a POST send follows the channel fader. Both come after the LOW CUT filter (if any) but on some models, the PRE send is taken before the equalizer section while on others it comes after the EQ. It may come either before or after the MUTE switch. Here's a summary for all of the Mackie mixers of where the Pre-fader AUX sends are taken:

Source for PRE Sends		
Model	EQ	Mute
1202/1402-VLZ PRO	Post	Pre
1604-VLZ PRO	Pre	Pre
1642-VLZ PRO	Pre	Pre
Onyx	Post	Pre
CFX	Post	Post
DFX	Pre	Post
SR	Post	Post
8-Bus	Switched	Post
PPM	Pre	NA

That's quite an assortment. The variations reflect both the most likely application, and what was in favor at the time the mixer was designed. Here are some common preferences:

Stage monitors are almost always fed from a pre-fader send, so that the engineer can create a mix for the musicians on stage and leave it alone once they're happy. (Turn the drummer up really loud in his monitor and he'll think he's really loud in the house.) Then you can mix the house according to your good taste.

In larger sound reinforcement systems, pre-EQ sends for the monitors are nearly always preferred since there's usually an outboard equalizer between the console and the monitor amplifier. If the monitors are fed after the channel equalizer, an EQ boost to bring out an instrument in the house might cause a blast of feedback on stage. Also, musicians don't like to hear you messing with "their tone."

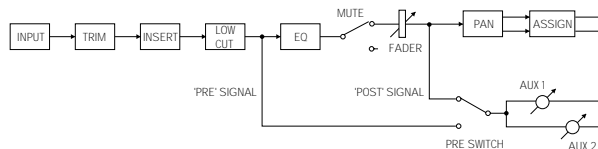
Studio headphone cue feeds are similar to stage monitors only there's no risk of feedback, so fidelity can come first. If an instrument sounds better in the control room with EQ, it will probably sound better to the musician too, so post-EQ monitor sends are usually preferred. A pre-fader send is a good idea, though, since a musician playing an overdub may want to hear a mix that helps him focus on his part, while the producer will want to hear a well balanced mix in the control room.

Effects sends are almost always post-fader and post-EQ. Generally you want to send a signal to the effects processor in proportion to its level in the mix. When you turn something down in a mix, you want the effect level to drop along with it. Sometimes, though, you may want the "dry" signal to fade out, leaving only the "effect"-ed version. Use a Pre-fader send to achieve this.

Having the pre-fader sends fed after the MUTE switch is very handy for live sound applications. When you mute a channel, it's muted everywhere.

PRE/POST Switches

Some AUX sends are hardwired one way or the other, and are labeled as such on the panel. Some models have switches that allow you to change the feed point of the Send from the front panel.

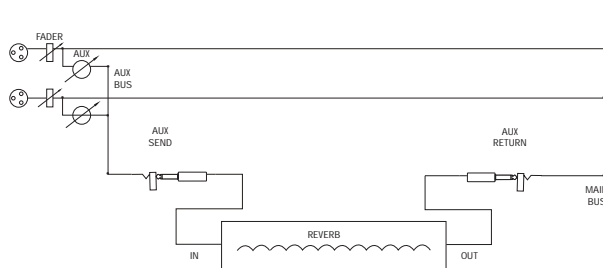


AUX Send Shift

Some Mackie consoles have six AUX SEND buses but only four AUX knobs. The SHIFT button selects whether their associated knobs send the channel signal to AUX outputs 3 and 4 or outputs 5 and 6 on a channel-by-channel basis.

Using AUXes with Effects

Here's the signal flow from the AUX send, through the AUX output, to a reverb unit, and back to the mix through the AUX Return jack.



This is sometimes called a “parallel” effect connection, since the path of the processed signal is in parallel with the dry signal path.

Built-in Effects

The CFX, DFX, and PPM series mixers have a built in digital effects processor (EMAC). The input of the EMAC is normally connected to the EFX bus (EFX 2 in the CFX), and the output is normally returned to the MAIN bus. The EFX send and return jacks on these mixers have normalling switch contacts – inserting a plug disconnects the normal send/return loop through the EMAC so that you can use them with an outboard processor.

With some clever cable juggling you can even use the EMAC processor as an outboard effect for another mixer.

EFX Foot Switch and Bypass

We've included some features on the effects-equipped mixers that will be welcomed by the musician or band working without a sound engineer. The Grand Canyon reverb might have sounded great on that ballad you just finished, but it really sounds dumb on your speaking voice, when you're introducing the next song. It's handy to be able to quickly kill the effects processor and then turn it back on when it's time for the next song.

The EFX BYPASS switch on the front panel mutes the signal to the effects processor when you're in

easy reach of the mixer. By plugging a normally open, latching (push-on-push-off) foot switch into the EFX FOOT SWITCH jack, you can mute the effect return without leaving your performing position. If the mixer is in sight, the lighted EFX BYPASS LED will remind you of why you're no longer in the Grand Canyon.



If you're using an outboard effects processor on the PPM instead of the EMAC, that will also be bypassed when either the front panel or foot switch is activated. On the CFX and DFX, however, the bypass switch comes ahead of the EFX RETURN 2 jacks, so an external processor coming in to the mix at that point will not be affected by the bypass foot switch.



Plugging in a foot switch disables the front panel EFX BYPASS switch.

Control Room Output

When recording, it's convenient to have an output with its own volume control that's dedicated to control room listening. Control Room outputs are on 1/4" balanced TRS jacks (unbalanced on the 8-Bus) and are fed from the Control Room Level control. This allows you to crank the playback level so the drummer can hear it, or turn it down to answer the telephone, all without disturbing the MASTER level, which you've set to send the proper level to the mixdown recorder.

The source for the Control Room output is selected by switches in the Master section of the console. The Main left/right outputs are always available to the control room monitor. Other choices, depending on the mixer, are the subgroups, ALT 3-4 bus, playback from a stereo recorder, Mix B, or another external source such as a CD player.

Headphone Output

The Headphone output is another copy of the Control Room output (the 8-Bus offers several other choices) followed by an amplifier capable of driving a set of headphones to a comfortable, no, a pretty darn loud level.



WARNING: When we say the headphone amp is loud, we're not kidding. It can cause permanent hearing damage (and headphone damage, too). Even intermediate levels may be painfully loud with some earphones. BE CAREFUL!

On some models, the headphones and control room share the same level control; on others, there's a separate control for headphone level.

Some models have two headphone jacks. The two jacks on the 1642-VLZ PRO are fed from the same point, and both follow the same Phones level control. The 8-Bus console has two completely independent headphone outputs, each having its own level control and source selector for two separate mixes to its headphone jacks.

Studio Output (8-Bus)

The Studio Output normally feeds an amplifier and speakers (or powered speakers) in the studio, so that the musicians can hear a playback without coming into the control room. These carry the same signal as the Control Room outputs, but have an independent level control so you can adjust the playback volume to suit the listeners.

The 8-Bus TALKBACK microphone can be routed to the Studio output, so that you can talk to the players through the studio monitor speakers.



WARNING: When you have mics live in the studio, they'll also be live in the studio monitors if the Studio output control is turned up. In the extreme case, you'll get feedback, but you don't want to record the speaker outputs either. When tracking, be sure to turn the Studio Level control down between playback.

The Studio Output jacks can be used with a second amplifier and speakers in the control room, so you can compare the mix on your high grade monitors with the boombox speakers the rest of the world listens to. To switch between the two, turn one level control down and the other one up, or easier, use an external monitor A/B switch.

Mix B Output (8-Bus)

The MIX-B jacks are 1/4" unbalanced outputs that carry the Mix B signal. We'll cover Mix B in depth later on, but briefly, it's an independent stereo mix that's usually used for monitoring the multitrack recorder returns when tracking.

Channel Inserts

The channel INSERT jacks allow you to break the channel signal path right after the mic preamp stage and its associated TRIM control (the low-cut filter too on some mixers) and insert a device such as a compressor, equalizer, or de-esser into the chain.

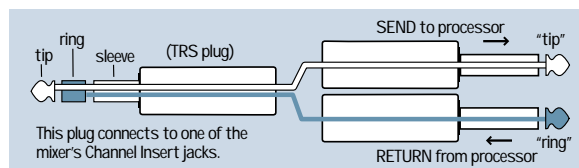
You can also insert a signal processor such as a delay, flanger, or reverb unit in the channel path to process the source coming into that channel. This is sometimes called a "serial" effect hookup since it's in series with the signal path.

Since most people who need only a small mixer, don't have racks full of processing gadgets, our smallest mixers don't have Inserts on every channel. The larger ones do.

The INSERT jack is a 1/4" TRS type, but in this instance, the two jack contacts are used as an output (send) from the preamp and an input (return) back into the remainder of the channel strip. Switch contacts built into the jack provide a "normal" connection from send to return when there's no plug inserted. When you push a plug all the way in, this connection is broken, and you have access to the channel insert points through the jack.

The tip of the plug connects to the SEND, and the ring connects to the RETURN. Since we're using only one contact of the jack for each connection, connections to and from the INSERT are unbalanced. The send is a low impedance line-level output that will drive any pro or semi-pro processing device. The RETURN is a moderate impedance line-level input that can be driven by almost any device.

You can buy an Insert cable off the rack at your local music store, or build one. Here's how it's wired:

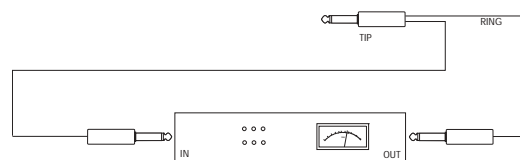


Tip = Send (Output to effects device)

Ring = Return (Input to effects device)

Sleeve = Common Ground (Shield connects to all three sleeves)

Here's how to hook an outboard signal processor in line with the channel path (a "serial" connection):



Insert Jack Tricks – Direct Outputs and Inputs

Besides being used for adding outboard signal processors to the channel signal path, the INSERT jacks can be used as pre-EQ direct outputs.

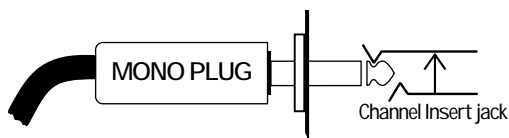
It's a fact - Mackie mic preamps have become so famous that people buy our mixers just to have the preamps in their arsenal. To use a preamp by itself, with nothing else in the signal path to the recorder, use the INSERT SEND to connect it directly to the recorder's input.

If you insert a plug into the jack gently, you'll feel two "clicks;" the first as the plug tip passes the ring contact, and the second when it settles into the tip contact. If you use a "mono" (TS) plug and insert it only as far as the first click, the ring contact will connect to the plug, sending the preamp out to whatever's on the other end of the cable.

But waitacottinpickinminnit! The ring is the return, isn't it?

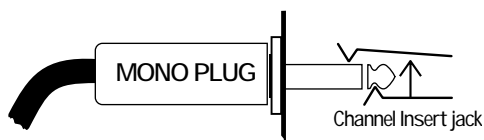
Yes, but with the plug inserted only halfway, the normalling switch contacts in the jack don't open – send and return are still connected. Since the normal connection is still intact, the signal passes through the channel path as well as coming out the INSERT jack as a direct output. If you're using the console for sound reinforcement and recording each input separately to a multitrack recorder, this is the cleanest way to feed the recorder inputs.

Here's what an Insert looks like up-close when used as a Direct Output:



Direct out with no signal interruption to master. Insert only to first "click."

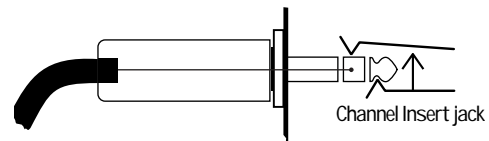
NOTE: If you want to keep the preamp signal out of the mix (you will if you're monitoring the returns from the recorder), push the plug all the way in. That will open the normal contacts.



Direct out with signal interruption to master. Insert all the way in to the second "click."

If you want to use an external mic preamp with your mixer (boo-hoo!), or perhaps a Voice Processor (combination preamp, compressor, equalizer, de-esser, and automatic word rememberer) you can completely bypass the fabulous world famous Mackie mic preamp by bringing the signal from your outboard preamp into the mixer through the INSERT Return.

To do this, you'll need a custom cable with a stereo (TRS) plug wired with the hot lead connected to the RING, the shield connected to the sleeve, and nothing connected to the tip.



Plugging this all the way into the jack will break the normalling contacts, replacing the Mackie preamp with the output from the outboard unit.



This connection also bypasses the TRIM control, so you'll need to adjust the Output Level control of your external preamp when using the Level-Setting Procedure. It's still important to check the channel level, even when using an outboard unit as the front end.

Utility Output (CFX Series)

The stereo signal from the UTILITY OUT 1/4" TRS jacks is the same as the MAIN output, but with its own level control, allowing you to set the level to an auxiliary set of speakers or a recorder without disturbing the main mix level.

These outputs are handy for driving "fill" speakers in areas of a room that aren't adequately covered by the main speakers. Or you might use them to feed speakers in the lobby, or the Green Room. (Regardless of the color, every concert venue has a Green Room – it's where the musicians and hangers-on hang out.)

UTILITY outputs are taken after the main fader, so adjustment of the MAIN level control will affect the UTILITY output level.

PPM Series Outputs

The PPM mixers have two power amplifiers built in. A flexible arrangement of switches and jacks allow you to use those two amplifiers for any combination of main and monitor speakers.

SPEAKER Out (PPM)

These 1/4" TS jacks carry the outputs of the power amplifiers.



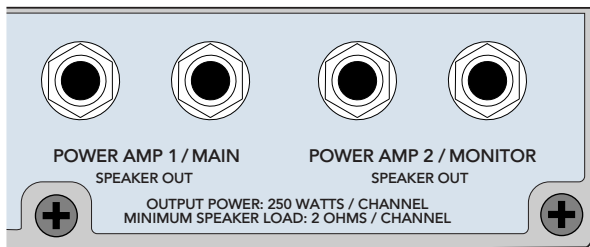
There's power behind these jacks – 125 to 600 watts depending on the model.

Don't connect them to anything other than passive speakers – not active speakers, not a recorder, not another mixer. **PASSIVE SPEAKERS ONLY!**



Caution: Don't use standard guitar cables to connect your speakers. Guitar cords are designed for line level signals and low currents, not the high currents and voltages of speaker levels. Use heavy duty speaker cables—at least 16 gauge. The heavier (lower gauge number) the better. Thin speaker cables equal thin sound!

There are two **SPEAKER OUT** jacks for each amplifier. The jacks are wired in parallel.



When you connect two speakers to a single amplifier, the load presented to the amplifier is the parallel impedance of both speakers. The total (parallel) impedance must be two ohms or greater.

- Two 8 ohm speakers in parallel equals 4 ohms.
- Two 4 ohm speakers in parallel equals 2 ohms.

The general formula for impedance in parallel is:

$$Z \equiv \frac{1}{\frac{1}{Z1} + \frac{1}{Z2} + \frac{1}{Z3}} \text{ etc.}$$

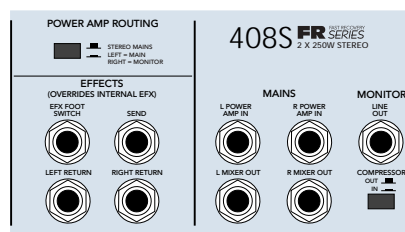
In electronics, Z is the symbol for impedance. We don't have a clue as to what word Z stands for.

Can you plug speakers with different impedances into the two jacks same amplifier? Sure, as long as

the total impedance isn't lower than 2 ohms. Chances are, however, that the efficiency of the speakers will be different enough that they'll produce noticeably different volumes. This may or may not be what you want.

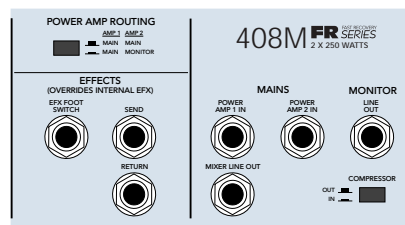
Note that the stereo and mono PPM mixers have different labels on the speaker connectors. They also have different options for routing MAIN and MONITOR mixes to those two amplifiers.

There's a convenient pushbutton to select the most common configurations. There are also patching jacks that allow you to rearrange things to your liking, or add an external power amplifier for more flexibility. See the PPM Applications for some suggestions



On the stereo mixers, the choices for Power Amp routing are:

- POWER AMP ROUTING - In
 AMP 1 – MAIN Mono (left + right)
 AMP 2 – Monitor
 Or
 POWER AMP ROUTING - Out
 AMP 1 – MAIN Left Channel
 AMP 2 – MAIN Right Channel



On the mono mixers, the choices are:

- POWER AMP ROUTING - In
 AMP 1 – MAIN
 AMP 2 – Monitor
 Or
 POWER AMP ROUTING - Out
 AMP 1 – MAIN
 AMP 2 – MAIN

On both the mono and stereo models, when the ROUTING switch is in the Out position, both power

amplifiers are dedicated to the MAINs. If you want to connect a stage monitor, you'll either need to use a powered speaker or an external power amplifier connected to the MONITOR LINE OUT jack.

The speaker outputs are affected by the MAIN MASTER level control and the MAIN Graphic Equalizer.

MONITOR Line Out (PPM)

This is a 1/4" unbalanced jack with a line-level signal suitable for driving powered speakers or power amplifiers. The signal is fed pre-fader and pre-EQ from the mixer's monitor bus. The MONITOR output has its own low-cut (rumble) filter, MONITOR MASTER volume, control and MONITOR graphic equalizer.

MIXER LINE OUT (Mono)

L or R MIXER OUT (Stereo)

These are 1/4" unbalanced line-level jacks that provide the main mixer output(s). The jack is fed from the MAIN mixer bus (left and right busses in the stereo version), following the MAIN MASTER control and MAIN graphic equalizer, and just ahead of the POWER AMP IN jack(s).

You can connect the MIXER OUT to an external power amplifier for more power and more speakers. Plugging into these jacks does not interrupt the signal flow to the PPM's built-in power amplifiers.

POWER AMP IN (PPM)

This is a 1/4" jack that accepts an unbalanced line-level signal. Whatever signal you plug into these jacks is combined with the internal mixer signals and routed to the power amplifiers. You could connect the LINE OUT jacks from another mixer (even another PPM) to the POWER AMP IN jacks to increase the number of channels available.

You could connect the outputs from the opening band's mixing board to these inputs. This way you don't have to set up two complete sound systems — the other band can use their mixer together with your PPM, using its amplifiers and your speakers.

On later production PPM mixers, these jacks are wired in the "normalled through" configuration allowing you to use an Insert Cable for patching in an outboard graphic equalizer, limiter, or crossover network.

POWERING UP! – Power supplies and Accessory Power

Compact Mixers

Of course you have to be able to turn your mixer on – but you don't want to turn it off inadvertently, either. To keep such accidents from happening, we hide the POWER switch on the rear panel of all of the Mackie compact mixers.

There's a power-on indicator on the front panel. Check your mixer's manual for its location if it's not obvious.

At Mackie, our compact mixers have internal power supplies. A standard IEC connector and power cord connects the mixer to an AC outlet. The power cord is an industry-standard item, so if you leave it behind, you won't have to look too far for a replacement. Most computers use the same power cord, and you can buy one at most computer or office supply stores as well as your local Radio Shack or music store.

All Mackie mixers will operate equally well from 50 or 60 Hz power. The Onyx mixers have "world friendly" power supplies that operate from 100 to 240 VAC (and they even ship with two power cords to accommodate US and European outlets). Other models are designed for only a single AC line voltage, depending on the country where you bought it. If you travel world-wide, you'll need a step-up or step-down transformer in countries that have a different line voltage than what's specified for your mixer.

8-Bus Console

The 8-Bus console has an outboard power supply with the main power switch on its front panel. The switch is also the power-on indicator.

Connect the power supply to the mixer using the special multiconductor cable provided, then connect the AC power to the power supply.

BNC Lamp Socket

Those decidedly non-audio-looking BNC connectors on the top panel of several Mackie mixers are for mounting and powering gooseneck lamps so you can find the knobs in the dark. The BNCs are wired with the center post at +12 VDC.



We recommend LittleLite lamps 12" gooseneck #12G or #12G-HI (a high-intensity version) for the smaller consoles, and the 18G-HI with an 18" gooseneck for the larger mixers. Buy them from your pro audio dealer.

Now that we've worked our way through the functions of most of the parts of a console, let's get physical and take it section by section, looking at the actual hardware. We'll continue to point out unique features of Mackie mixers, but with what you learn here, you should be able to walk up to just about any mixer and understand it in just a couple of minutes.

Notes
